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ABSTRACT

This is the first of eight guidebooks for a course designed for the junior high student preparing for algebra. The booklet includes place value, expanded numerals, exponents, and elementary set theory. General goals and performance objectives, a course outline, and sample posttest items are given. (DT)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

C P Structures 1

5210.21

Mathematics

DADE COUNTY PUBLIC SCHOOLS

DIVISION OF INSTRUCTION • 1971

ED 067285

QUINMESTER MATHEMATICS

COURSE OF STUDY

FOR

C P STRUCTURES I

5210.21

(EXPERIMENTAL)

Written by

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for the

DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida 33132
1971-72

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PREFACE

The following course of study has been designed to set a minimum standard for student performance in the continuous progress sequence. It is primarily a quin for the junior high student who is preparing for algebra. The quin should give direction to the teacher and outline a minimum course content. The objectives are general enough so they will fit a variety of programs, yet specific enough so there is no doubt about what is to be covered in the course.

The course sequence is suggested as a guide; an individual teacher should feel free to rearrange the sequence whenever other alternatives seem more desirable. Since the course content represents a minimum, a teacher should feel free to add to the content specified. No strategies are included due to the individualized nature of this quin course. The teacher may wish to use a variety of materials, methods and/or individualized texts. Assorted materials may be used as long as the minimum objectives of this course have been met.

Any comments and/or suggestions which will help to improve the existing curriculum will be appreciated. Please direct your remarks to the Consultant for Mathematics.

All courses of study have been edited by a subcommittee of the Mathematics Advisory Committee.

CATALOGUE DESCRIPTION

The first of eight C P quins which will prepare the student for success in Algebra. Includes place value, reading and writing numbers, positive exponents, expanded notation, and elementary set theory.

Designed for the student who wishes to take Algebra in either ninth or tenth grade.

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GOALS

1. To develop an understanding of place value.
2. To refine the skills of reading and writing whole numbers.
3. To develop an understanding of exponential notation.
4. To introduce the study of set theory.

PERFORMANCE OBJECTIVES

The student will:

1. Construct a place value chart for any whole number less than ten (10) billion.
2. Expand whole numbers of six (6) places or less, using exponential notation.
3. Write in words or read aloud any whole number of six (6) places or less.
4. Write a numeral for any whole number of six (6) places or less, which is given by its word name.
5. Identify the exponent, base, and power in a given exponential expression.
6. Write groups of repeated factors in exponential form.
7. Write numbers expressed in exponential notation as groups of repeated factors and also as decimal numerals.
8. Write in roster form a set that has been given by rule.
9. Identify the meanings of the following symbols:

   $\in, \notin, \emptyset, \subset, \ldots, \{\ \}, \cup, \cap, \bar{A}$

10. Demonstrate an understanding of one-to-one correspondence between two sets.
11. Differentiate between finite, infinite, and empty sets.
12. Differentiate between equal, equivalent, and disjoint sets.
13. Write all the subsets of a given set of three elements or less.
14. Perform the operations of union, intersection, and complementation on given sets.

COURSE OUTLINE

I. PLACE VALUE

A. Expressing the place values

1. In words
2. In numerals
3. Using the factor 10

B. Patterns

1. Left - increasing by multiplying by ten
2. Right - decreasing by dividing by ten

II. EXPANDED NUMERALS

A. Writing numerals as sums

1. $526 = 500 + 20 + 6$
2. $526 = 5 \cdot 100 + 2 \cdot 10 + 6 \cdot 1$
3. $526 = 5 \cdot 10 \cdot 10 + 2 \cdot 10 + 6 \cdot 1$

III. EXPONENTS

A. Definitions

1. Exponents greater than 1
2. Base
3. Power

B.. Using the definition

1. Factors to powers $5 \cdot 5 \cdot 5 = 5^3$
2. Powers to factors $2^3 = 2 \cdot 2 \cdot 2$
3. Powers to decimal numerals $3^3 = 27$

C. Definitions

1. $x^1 = x$
2. $x^0 = 1$

D. Application to expanded numerals

1. $526 = 5 \cdot 10^2 + 2 \cdot 10^1 + 6 \cdot 10^0$

IV. SETS AND SET NOTATION

A. Definitions

1. Set - $\{\ \}$,...
2. Element - $\in$, $\notin$
3. Universe - U

B. Classifications

1. Empty - $\emptyset$
2. Finite
3. Infinite

C. Relationships

1. One-to-one correspondence
2. Equal - = , $\neq$
3. Equivalent
4. Disjoint
5. Subset - $\subset$, $\not\subset$

D. Operations

1. Union - $\cup$
2. Intersection - $\cap$
3. Complementation - $\bar{A}$

V. OPTIONAL TOPICS

A. Ancient numeration systems

B. Other bases

C. Venn diagrams

SAMPLE POSTTEST ITEMS

1. Make a place value chart showing the place value of each digit in the number 6,259,071,348.

2. Expand the following numbers, using exponential notation.

   a. 246 =
   b. 3,402 =
   c. 75 =
   d. 24,431 =
   e. 943,017 =
   f. 8,010 =

3. Write the word names of these numbers.

   a. 604 =
   b. 3,482 =
   c. 68 =
   d. 24,731 =
   e. 800,014 =
   f. 92,806 =

4. Write the numerals for these numbers.

   a. One thousand, fifty-eight
   b. Six thousand, two hundred fifty-five
   c. Fifty-eight thousand, six hundred four
   d. Nine hundred thousand, three
   e. Five thousand, two
   f. Eighteen thousand, five hundred sixty-two

5. a. Circle each exponent

   5^3 $\quad$ $3 \cdot 3 \cdot 3$ $\quad$ $4 \cdot 7^5$

   b. Circle each base

   8^7 $\quad$ $\frac{6^2}{9}$ $\quad$ $15 + 15$

   c. Circle each power

   $12 \cdot 2$ $\quad$ $5^5 \cdot 3^2$ $\quad$ 4^3

6. Write these products in exponential form.

   a. $2 \times 2 \times 2 =$ _____

   b. $3 \times 3 \times 3 \times 3 =$ _____

   c. $5 \times 5 \times 5 \times 5 =$ _____

   d. $3 \times 3 \times 2 \times 2 \times 2 =$ _____

   e. $7 \times 7 \times 2 \times 2 \times 2 \times 2 =$ _____

   f. $3 \times 2 \times 2 \times 3 \times 5 =$ _____

7. Express each number as a product without exponents and also as a single decimal numeral.

   a. $2^3 \cdot 7^2 =$ _____ $=$ _____

   b. $3^4 =$ _____ $=$ _____

   c. $9^2 =$ _____ $=$ _____

   d. $7^5 =$ _____ $=$ _____

   e. $2^5 \cdot 3^2 =$ _____ $=$ _____

8. Write these sets in roster form.

   a. The first 3 letters of the alphabet _____

   b. Odd whole numbers _____

   c. The days of the week that begin with the letter "T" _____

   d. The digits of our number system _____

9. Match the symbols with the words they represent. Write the number of the answer you select.

a. $\in$	(1) intersect
b. $\notin$	(2) set braces
c. $\emptyset$	(3) union
d. $\subset$	(4) is an element of
e. ...	(5) empty or null set
f. $\cup$	(6) is not an element of
g. $\cap$	(7) subset
	(8) continues on in the same pattern

10. Answer true if there is a one-to-one correspondence between a pair of sets, false if not.

a. $\{1, 2, 3\}$ and $\{4, 5, 6\}$ _____

b. $\{7, 8\}$ and $\{7, 8, 9\}$ _____

c. $\{51\}$ and $\{5, 1\}$ _____

d. $\{\quad\}$ and $\{0\}$ _____

e. $\{6, 8, 10\}$ and $\{1, 2, 3\}$ _____

f. $\{4, 5, 6\}$ and $\{2, 4, 6 \ldots\}$ _____

11. Choose the name that best describes each of these sets.

a. $\{1, 2, 3\}$	(1) finite
b. $\{1, 2, 3 \ldots\}$	(2) infinite
c. $\{2, 4, 6 \ldots\}$	(3) empty
d. {purple cows}	
e. {even numbers ending with 3}	
f. $\{4, 9, 7, 8\}$	

12. Choose the name(s) that describes each pair of sets.

a. $\{1, 2, 3\}$ and $\{2, 1, 0\}$

b. $\{4, 7, 3\}$ and $\{10, 12, 18\}$

c. $\{1, 8, 7\}$ and $\{7, 6, 5, 4\}$

d. {Whole numbers between 0 and 4} and $\{1, 2, 3\}$

e. $\{7, 4, 6, 3\}$ and $\{9, 5, 8\}$

(1) equal

(2) equivalent

(3) disjoint

(4) none of the above

13. List <u>all</u> the subsets of these sets.

a. $\{1\}$

b. $\{6, 2\}$

c. $\{a, x, y\}$

d. $\{p, m\}$

14. Perform the indicated operations on these sets.

a. $\{1, 2\} \cap \{1, 2, 3, 4...\}$

b. $\{6, 5, 9\} \cup \{6, 7, 8, 9\}$

c. $\{14, 15\} \cap \{4, 5, 6\}$

d. $\{9, 10, 11, 12\} \cap \{7, 8, 9\}$

e. $\{x, p, q\} \cup \{m, y, p\}$

f. $\{1, 3, 5...\} \cap \{2, 4, 6...\}$

14. (continued)

If $U = \{3, 4, 6, 7, 8, 9, 10, 12\}$

$A = \{3, 6\}$ and

$B = \{6, 8, 9, 10\}$, then:

g. $A \cup B =$

h. $A \cap B =$

i. $\overline{A} =$

j. $\overline{B} =$

k. $\overline{A} \cap B =$

l. $\overline{A \cup B} =$

ANSWER KEY

1.

billions	hundred millions	ten millions	millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones
6	2	5	9	0	7	1	3	4	8

2. a. $(2 \times 10^2) + (4 \times 10^1) + (6 \times 10^0)$

   b. $(3 \times 10^3) + (4 \times 10^2) + (2 \times 10^0)$

   c. $(7 \times 10^1) + (5 \times 10^0)$

   d. $(2 \times 10^4) + (4 \times 10^3) + (4 \times 10^2) + (3 \times 10^1) + (1 \times 10^0)$

   e. $(9 \times 10^5) + (4 \times 10^4) + (3 \times 10^3) + (1 \times 10^1) + (7 \times 10^0)$

   f. $(8 \times 10^3) + (1 \times 10^1)$

3. a. Six-hundred four

   b. Three thousand, four hundred eighty-two

   c. Sixty-eight

   d. Twenty-four thousand, seven hundred thirty-one

   e. Eight hundred thousand, fourteen

   f. Ninety-two thousand, eight hundred six

4. a. 1,058
   b. 6,255
   c. 58,604
   d. 900,003
   e. 5,002
   f. 18,562

5. a. 5^{3} $4 \cdot 7^{5}$
   b. 8^{7} 6^{2}
   c. $5^{5} \cdot 3^{2}$ 4^{3}

6. a. 2^3
   b. 3^4
   c. 5^4
   d. $3^2 \times 2^3$
   e. 7×2^4
   f. $3^2 \times 2^2 \times 5$

7. a. $2 \cdot 2 \cdot 2 \cdot 7 \cdot 7 = 392$
   b. $3 \cdot 3 \cdot 3 \cdot 3 = 81$
   c. $9 \cdot 9 = 81$
   d. $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 = 16{,}807$
   e. $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 = 288$

8. a. $\{a, b, c\}$
   b. $\{1, 3, 5, 7...\}$
   c. $\{\text{Tuesday, Thursday}\}$
   d. $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$

9. a. (4)
   b. (6)
   c. (5)
   d. (7)
   e. (8)
   f. (3)
   g. (1)

10. a. T
    b. F
    c. F
    d. F
    e. T
    f. F

11. a. (1)
    b. (2)
    c. (2)
    d. (3)
    e. (3)
    f. (1)

12. a. (2)
    b. (2)(3)
    c. (4)
    d. (1)(2)
    e. (3)

13. a. $\{1\}\ \emptyset$
    b. $\{6, 2\}\ \emptyset\{6\}\ \{2\}$
    c. $\{a, x, y\}, \emptyset, \{a\}, \{x\}, \{y\}, \{a, x\}\ \{a, y\}, \{x, y\}$
    d. $\{p, m\}, \{p\}, \{m\}, \emptyset$

14. a. $= \{1, 2\}$
    b. $= \{6, 5, 9, 7, 8\}$
    c. $\emptyset$
    d. $\{9\}$
    e. $\{x, p, q, m, y\}$
    f. $\emptyset$
    g. $\{3, 6, 8, 9, 10\}$
    h. $\{6\}$
    i. $\{4, 7, 8, 9, 10, 12\}$
    j. $\{3, 4, 7, 12\}$
    k. $\{8, 9, 10\}$
    l. $\{4, 7, 12\}$